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Research Article / Araştırma Makalesi

Match characteristics of professional outfield amputee soccer players during official amputee soccer matches

Ampute futbolcuların resmi ampute futbol maçlarına verdikleri yanıtlar

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ABSTRACT

Objective: The objective of this study was to investigate physiological responses and movement profiles of amputee soccer players during official matches.

Material and Methods: Five outfield amputee soccer players with a 9.20±0.81 years of amputee soccer experience (age 28.60±5.32 years; height 1.71±0.05 m; body mass 71.54±9.39 kg) volunteered for this study. Physiological responses [blood lactate (BLa), heart rate (HR) and ratings of perceived exertion (RPE)] and activity profiles [peak speed, total distance covered (TD), TD at five speed categories (SC), percentages of TD at five SC and time spent in four maximal heart rate (HR_{max}) zones] were analyzed during seven official amputee soccer matches.

Results: Mean game BLa, RPE, HR and HR_{max} were 5.58±1.63 mmol.L^{-1}, 9.43±2.62, and 151.77±16.05 bpm and 180.74±9.23 bmp, respectively. HR_{max} was higher in the first half than in the second half (p=0.02). Players covered 102.62±7.24 m.min^{-1} and this did not change between the halves during amputee soccer matches (p=0.40). TD at very low SC was 73.86±0.57 m.min^{-1} whereas TD at very high SC accounted only for 0.24±0.04 m.min^{-1}. Similarly, the percentage of the TD at very low SC was 70.18±10.30% and the percentage of the TD at very high SC was 0.24±0.04%. Amputee soccer players spent ~31 min and ~15 min at high intensity and moderate HR_{max} zones, respectively. These accounted only about ~5 min at very low and low intensity HR_{max} zones during whole matches.

Conclusion: These results showed that amputee soccer played at the professional level is a high-intensity exercise, which could be used to prescribe amputee soccer specific training regimes.

Keywords: *Amputee soccer player, activity pattern, actual match analysis, physiological response*

ÖZ

Amaç: Bu çalışma ampute futbolcuların resmi maçlara verdiği fizyolojik yanıtları ve hareket profillerini incelemek amacıyla yapılmıştır.

Gereç ve Yöntemler: Çalışmaya ampute futbol spor yaş ortalaması 9.20±0.81 yıl olan beş ampute futbol oyuncusu gönüllü olarak katılmıştır (yaş: 28.60±5.32 yıl; boy: 1.71±0.05 m; vücut ağırlığı: 71.54±9.39 kg). Ampute futbol maçına verilen fizyolojik yanıtlar [kan laktat (LA), kalp atım hızı (KAH) ve algılanan zorluk derecesi (AZD)] ve hareket profilleri [ulaşılan maksimal hız, kat edilen toplam mesafe ($Mesafe_{top}$), beş farklı koşu hızlarında kat edilen $Mesafe_{top}$, beş farklı koşu hızında kat edilen $Mesafe_{top}$ yüzdesi ve dört maksimal kalp atım hızı (KAHmaks) yüzdesine göre geçirilen süreler] toplam 7 resmi maç ile belirlenmiştir.

Bulgular: Ortalama maç LA, AZD, KAH ve KAH_{maks} yanıtları sırasıyla 5.58±1.63 mmol.L^{-1}, 9.43±2.62, ve 151.77±16.05 atım.dk^{-1} ve 180.74±9.23 atım.dk^{-1} olarak bulunmuştur. Birinci yarı KAH_{maks} yanıtları ikinci yarıya göre daha yüksektir (p=0.02). Ampute futbolcuların maçta kat ettikleri mesafe 102.62±7.24 m.dk^{-1} olarak bulunmuştur ve $Mesafe_{top}$ devrelere göre farklı değildir (p=0.40). Çok düşük şiddetli koşu hızında $Mesafe_{top}$ 73.86±0.57 m.dk^{-1} iken çok yüksek şiddetli koşu hızında 0.24±0.04 m.dk^{-1} olarak bulunmuştur. Benzer şekilde, çok düşük şiddetli koşu hızında $Mesafe_{top}$ yüzdesi 70.18±10.30 ve çok yüksek şiddetli koşu hızında $Mesafe_{top}$ yüzdesi 0.24±0.04'tür. Ampute futbolcular maç sırasında ~31 dakikayı yüksek ve ~15 dakikayı orta şiddetli KAH_{maks}bölgelerinde geçirmişlerdir. Tüm maçlarda çok düşük ve düşük şiddetli KAH_{maks} bölgelerinde geçirilen süreler ~5 dakika olarak bulunmuştur.

Sonuç: Bu çalışmanın bulguları profesyonel seviyede oynanan ampute futbolun yüksek şiddetli bir egzersiz olduğunu ve ampute futbola özgü yüksek şiddetli antrenman yöntemlerinin uygulanması gerektiğini göstermiştir.

Anahtar Sözcükler: *Ampute futbolcu, aktivite profili, gerçek maç analizi, fizyolojik yanıt*

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INTRODUCTION

Amputee soccer is developed for athletes with a physical impairment with unilateral lower and upper limb amputation (1, 2). Two teams play amputee soccer on 60 meters long 40 meters wide pitch. Each team consists of 6 outfielders and 1 goalkeeper. Outfielders use bilateral crutches to move on the pitch and these players are not permitted to wear prosthetic devices during the match. The duration of the matches consists of two 25-minute halves with a ten minutes rest in between. In the literature, the match demands of soccer have widely been investigated during official and training matches using metabolic, physiological measures and global positioning systems to examine the activity patterns (3-7). These results provided coaches and sport scientists valuable information for the development of sport specific training strategies for players. However, despite the popularity of amputee soccer around the world, there is paucity of data examining the physiological responses and activity profiles during amputee soccer matches (1, 8). Moreover, there is no study in the literature examining the physiological responses and activity profiles of amputee soccer players during official match play.

There is a wealth of research on the physical fitness characteristics of amputee soccer players (9-15). It is also reported that amputation level, amputation age and physical fitness levels affect the performance of amputee soccer players (10, 13, 16-18). Information regarding the movement patterns and physiological responses of amputee soccer players to actual match play would aid coaches to prepare objective and realistic training programs. Therefore, physiological measurements and methods to analyze activity patterns in amputee soccer are needed as the population is very unique and the demands could be even more specific due to the degree of lower limb amputation. Accordingly, it will be possible to define the physiological requirements of amputee football players and develop various training approaches that can be applied to improve physical and tactical performance. Training programs specific for amputee soccer can be planned by the coaches and sport scientists in order to establish training load particular to amputee soccer players. Therefore, the goal of the current study was to investigate the physiological responses and activity patterns of **outfield** amputee soccer players during official amputee soccer match.

MATERIALS and METHODS

Participants

Five elite male outfield amputee soccer players from the same amputee soccer team volunteered for this study. Descriptive statistics of amputee football players are shown in Table 1. The reasons for disability of amputee players were as follows; two congenital amputations, two resulted from traffic accidents and one due to occupational accident. Their amputation levels were transtibial (n=2) and transfemoral (n=3). All players were free of injury, not on medication, filled a medical screening questionnaire and signed consent form before participating to this study. Ethical approval was provided by the institutional university ethics committee (GO 18/106) and this study was conducted in accordance with the 2013 Helsinki Declaration.

Table 1. Descriptive statistics of amputee soccer players.

Variable	*M ± SD*	*Minimum*	*Maximum*
Age (years)	28.60 ± 5.32	23.00	37.00
Height (m)	1.71 ± 0.05	1.65	1.76
BM (kg)	71.54 ± 9.39	59.40	83.30
BMI (kg/m²)	24.36 ± 2.46	21.73	26.89
BF%	17.85 ± 4.72	10.66	22.51
FM (kg)	13.10 ± 4.83	6.33	17.94
FFM (kg)	58.44 ± 4.77	53.07	65.36
Amputation age (years)	24.00 ± 2.35	22.00	27.00
Canadian Crutch usage age (years)	14.20 ± 6.57	9.00	24.00
Amputee soccer age (years)	9.20 ± 0.81	8.00	10.00
Sport age (years)	10.80 ± 2.39	9.00	15.00

BM: body mass; BMI: body mass index; FFM: fat free mass; FM: fat mass; BF%:body fat percentage.

Anthropometric measurements

Height (cm) and body mass (kg) measurements were performed with the use of standard techniques (19). Outfield amputee soccer players were requested not to wear prosthesis before having their stature and body mass measured. Body composition measurement procedures followed the protocol described elsewhere (20). Extremity skinfolds were measured to the nearest ±2 mm at the chest, triceps and subscapular sites with two trials at each site with a single trained researcher (20, 21). The mean of the two trials were calculated for the estimation of body composition. Body density (21) was transformed to percent body fat (BF%) using the Siri formula (22). Fat free mass (FFM) (kg) and fat mass (FM)(kg) were calculated using the formulas below (23).

1. Body density= 1.1125025 – [0.0013125 x (sum of chest, triceps, and subscapular skinfolds] +

[0.0000055 x (sum of chest, triceps, and subscapular skinfolds) ^{2}] - (0.000244 x age in years)

2. BF%= [(495 / Body density) – 450] * 100
3. FFM= Body mass (kg) – fat mass (kg)
4. FM= (Body mass (kg) * BF%)/100

Design

The study was performed during first period of the 2019-2020 amputee soccer super league season. An observational design was used to evaluate the activity profiles and physiological responses during 7 official away amputee soccer matches. The stressful conditions of official matches may negatively affect match performance of players (24). Therefore, some players decided not to wear chest belt and wrist receiver and number of amputee soccer players was limited to 5 elite professional outfield amputee soccer players. The mean data calculated from the 7 official matches was analyzed as activity patterns and physiological responses during official amputee soccer matches for each outfield amputee soccer players.

Determination of HR_{max}

There is no ecologically validated field test protocol in the literature to determine aerobic capacity of amputee football players who have gone through an amputation. Locomotor activity varies in individuals with a lower limb amputation compared to healthy counterparts (13, 25). Using Lofstrand crutches affects walking and running mechanics and correspondingly, energy demands increases among individuals who have gone through a lower limb amputation (25-27). It has also been reported that amputee soccer players covered lower distances and performed worse compared to regular soccer players in tests which incorporates change of direction (negative and positive accelerations) such as Yo-Yo Intermittent Test (12). In the current study, 20 m shuttle run test starting speed was modified to determine HR_{max} of amputee soccer players and circular track was formed to avoid positive and negative accelerations (Figure 1). Therefore, amputee soccer players completed continuous incremental progressive field test to volitional exhaustion for determination of individual HR_{max}. Running pace and duration of the test were controlled through audio signals from a signal generator (Sport Expert, Tümer Electronic, Ankara).

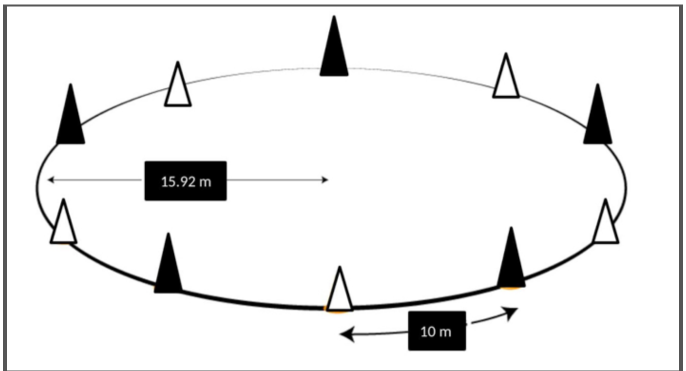

Figure 1. Modified shuttle run test: Black cones represent central cones and white cones represent intermediate cones

The speed is increased 0.5 km/hr each minute from a starting speed of 6 km/hr. The test was performed on a synthetic turf in a 100 m circular track. The track was divided into 10 m intermediate and 20 m central cones. Each shuttle in 20 m central cones was recorded and accepted as a shuttle during circular running and the test ended when the participant could no longer catch the sound signal twice by the 10 m intermediate cone. HR was continuously monitored during the test and the highest HR was registered as the maximal value obtained at the end of the test. Results related to field test is shown in Table 2.

Table 2. Physiological responses and activity patterns during field test

Variables	*M ± SD*	*Minimum*	*Maximum*
HR_{max}(bpm)	187.60 ± 7.50	178.00	197.00
Number of shuttles	87.40 ± 15.14	69.00	107.00
Distance (m)	1760.00 ± 470.00	1310.00	2550.00
$Speed_{peak}$ (km/hr)	11.46 ± 0.80	10.50	12.50

HR_{max}(bpm): maximal heart rate attained during field test; $Speed_{peak}$ (km/hr): peak speed attained during field test.

Physiological responses

The 20 point RPE Scale described by Borg (28) was used immediately after the both halves. Blood lactate (BLa) of the amputee soccer players was analyzed through a calibrated portable analyser (EKF Lactate Scout, Germany) at rest ([BLa_{-rest}]) and within the 3 minutes after the halves. HR was continuously recorded during matches every 1 s using a HR monitor (Polar M430, Kempele, Finland) with a chest belt and wrist receiver. Resting HR (HR_{rest}) of players was recorded continuously for 20 minutes while they were resting in a seated position and the average of the last 5 minutes was calculated as HR_{rest}. HR_{peak} was taken to be the highest achieved during and both halves of amputee soccer match, while HR_{mean} was calculated as the average of HR measured during and in both halves of amputee soccer match.

Activity patterns

Peak speed ($speed_{peak}$) (km/hr), total distance covered TD (m), TD at five speed categories (SC) (m) and percentages of TD at five SC in both halves of amputee soccer match were collected by a HR monitor with 50-Hz GPS (Polar M430, Kempele, Finland). Analysis of activity patterns was defined as described elsewhere (8). The absolute TD covered by amputee soccer players were converted to relative analysis of the TD per unit of time ($m.min^{-1}$) and TD represented the summation of distances in all speed categories (29). Additionally, calculated distances for each SC during match and in both halves were defined as percentages of the TD. Besides, activity patterns were determined with the percentages of individual HR_{max} obtained from the progressive field test as HR_{max} intensity zones [0-40% (low-intensity), 40-60% (moderate-intensity), 60-80% (high-intensity) and 80-100% (maximal)]. Time spent as seconds at each HR_{max}zone was calculated for each HR_{max} intensity zone.

Data analysis

The data are presented as the means and standard deviations (SD). Wilcoxon signed-ranks test was used to examine differences in outcome measures between the halves.-Data were analyzed using SPSS version 22.0 software.

RESULTS

Analysis of physiological responses

Mean HR_{rest} and [BLa_{rest}] of amputee soccer players were 73.66±7.40 bpm and 1.73±0.40 $mmol.L^{-1}$, respectively. HR_{peak} and HR_{mean} reached during official amputee soccer match were 180.74±9.23 bpm and 151.77±16.05 bpm, respectively. The HR_{peak} in the first half was significantly higher than in the second half (184.14±8.59 bpm vs 177.33±9.14 bpm, z=-2.32, p=0.02, respectively). Although there was a decline in HR_{mean} in the second half, there was not statistically significant difference between the halves (154.29±21.85 bpm vs 149.24±8.10 bpm,z=-1.01, p=0.31, respectively). RPE and [BLa] responses during the amputee soccer match were 9.43±2.62 and 5.58±1.63 $mmol.L^{-1}$, respectively. Results revealed no statistically significant differences in RPE and [BLa] between the first and second half (10.14±2.34 vs 8.71±2.87, z=-1.36, p=0.17; 5.74±2.21 $mmol.L^{-1}$ vs 5.41±0.90 $mmol.L^{-1}$, z=-0.34, p=0.74, respectively). Results are given in Table 3.

Table 3. Results of physiological responses to amputee soccer match

Variable	Match	First half	Second half	z	p
HR_{peak}(bpm)	180.74±9.23	184.14±8.59	177.33±9.14	-2.32	**0.02**
HR_{mean}(bpm)	151.77±16.05	154.29±21.85	149.24±8.10	-1.01	0.31
RPE	9.43±2.62	10.14±2.34	8.71±2.87	-1.36	0.17
BLa ($mmoll^{-1}$)	5.58±1.63	5.74±2.21	5.41±0.90	-0.34	0.74

HR_{peak}: peak heart rate attained during match; HR_{mean}: mean heart rate attained during match; RPE: Rate of perceived exertion; BLa: Blood lactate concentration

Analysis of activity patterns

The relative TD during amputee soccer match was 102.62±7.24 m/min and statistical analysis showed that amputee soccer players covered similar distances in both halves (50.72 ± 3.55 m/min vs 51.90 ± 4.64, z=-0.85, p=0.40, respectively) (Table 4). TD covered in very low, low, moderate, high and very high SC were 73.86±0.57 m/min, 16.97±1.20 m/min, 9.04±0.21 m/min, 2.46±0.23 m/min and 0.24±0.04 m/min, respectively. There were no statistically significant differences in TD at five SC in both halves (p>0.05).

Table 4. Results of relative total distance covered at five speed categories

Variable	Match	First Half	Second Half	z	p
Total distance (m)	102.62±7.24	50.72±3.55	51.90±4.64	-0.85	0.40
Speed categories					
Very low (0-7 m/min)	73.86±0.57	37.50±4.37	36.36±4.65	-0.85	0.40
Low (7.1-9.5 m/min)	16.97±1.20	7.29±2.90	9.68±3.02	-1.52	0.13
Moderate (9.6-13.2m/min)	9.04±0.21	4.31±2.02	4.73±1.46	-0.51	0.61
High (13.3-16.8 m/min)	2.46±0.23	1.46±1.39	1.00±0.91	-1.57	0.12
Very high (>16.9 m/min)	0.24±0.04	0.16±0.42	0.08±0.22	-0.45	0.65

Results revealed that $speed_{peak}$ attained during amputee soccer match was 15.77±2.33 km/hr and there was not significant difference in $speed_{peak}$ attained between the first and second half (15.43±2.40 vs 14.65±1.39, z=-0.68, p=0.50, respectively). Current results revealed that 70.18±10.30 % of the TD at very low speed while low, moderate, high and very high efforts account for 16.28±5.23, 8.79±3.27 %, 2.34±2.16 % and 0.24±0.64 % of the TD, respectively. As shown in Table 5, statistical analysis did not identify a significant difference on the percentage of TD during five SC categories in both halves (p>0.05)

Table 5. Percentages of total distance covered at five speed categories and maxima speed attained during amputee soccer match

Speed categories	Match	First Half	Second Half	z	p
Very low (0-7 m.min^{-1})	70.18±10.30	73.94±9.72	66.42±10.13	-1.69	0.09
Low (7.1-9.5 m.min^{-1})	16.28±5.23	14.21±5.14	18.36±4.78	-1.35	0.18
Moderate (9.6-13.2 m.min^{-1})	8.79±3.27	8.37±3.67	9.21±3.05	-0.51	0.61
High (13.3-16.8 m.min^{-1})	2.34±2.16	2.82±2.61	1.87±1.65	-1.57	0.12
Very high (>16.9 m.min^{-1})	0.24±0.64	0.32±0.84	0.16±0.41	-0.45	0.65
Maximal speed (km/hr)	15.77±2.33	15.43±2.40	14.65±1.39	-0.68	0.50

When HR_{peak} values were expressed as a percentage of the individual HR_{max}, amputee soccer players spent 1525.34±260.68 s which corresponded to 80-100% individual HR_{max} and time spent at the 80-100% HR_{max} showed significant difference in first half than in the second half (961.14±369.80 s vs 564.20±311.13 s, z=-2.20, p = 0.03). Time spent at 60-80% and 40-60% individual HR_{max} was 751.43±40.00 s and 38.49±1.34 s, respectively. As shown in Table 6, results of the comparison between the halves showed no significant differences in time spent at the percentages of HR_{max} intensity zones (p>0.05).

Table 6. Time spent at individual heart rate intensity zones.

Intensity zones	Match	First Half	Second Half	z	p
Low (0-40%)	00.00±00.00	00.00±00.00	00.00±00.00	0.00	1.00
Moderate (40-60%)	38.49±1.35	18.29±30.07	20.20±15.74	-0.37	0.71
High (60-80%)	751.43±40.00	347.43±146.39	404.00±124.27	-0.94	0.35
Maximal (80-100%)	1525.34±260.68	961.14±369.80	564.20±311.13	-2.20	**0.03***

DISCUSSION

Analysis of physiological responses

The HR_{peak} recorded during official amputee soccer match play in the present study were similar with those recorded in the previous studies (1, 8). The higher HR in amputee soccer is probably a result of high load on the anaerobic metabolism and these values indicated that amputee soccer players are performing very vigorous activity during amputee soccer match. Moreover, the HR_{mean} value obtained during amputee soccer match in the current study was lower than the previous studies (8). This discrepancy could be correlated with the level of amputee soccer players' physical conditioning. It was demonstrated that energy cost and performance of lower limb amputees were worse during walking and running activities compared to non-amputees (27) and amputee soccer players had higher energy costs during amputee soccer match than non-amputated soccer players (1). It is difficult to compare with findings of other intermittent team sports due to differences in rules, duration and field of play. Comparable results have been reported for futsal (30) and soccer (31). We observed significant differences in HR_{peak} between the first and second halves and there was a decline in the second half. The decrease in intensity seemed to occur in the second half due to fatigue.

Our results in relation to RPE response to amputee soccer match may suggest that amputee soccer players experienced a higher physiological stress. The mean [BLa] response obtained at post-amputee soccer game in the current study was 5.81±1.63 mmol.L^{-1} and it was similar in both halves. [BLa] comparison between the halves in a previous study conducted with amputee soccer players revealed similar results (8). The mean match [BLa] is three times higher than resting [BLa] suggesting that anaerobic energy provision is taxed frequently in the amputee soccer match.

Analysis of activity patterns

During the 50 min amputee soccer match, amputee soccer player covered 102.60±7.24 m per minute at various speeds. Extrapolating the amputee soccer playing time to the 90 min conventional soccer duration, both amputee and conventional soccer players cover ~110-120 m/min during games (29, 32). Amputee soccer players covered 113 m/min in a similar study (8). These results are higher than the present sudy. This discrepancy could be due to a myriad of other factors such as differences in methods of analysis as well as the features of participants who took part in studies (1). It has been reported that 80-90% activities are performed in low to moderate intensities in soccer (4). Three fourth of amputee soccer match activities in the current study are performed in very low to low intensities and amputee soccer players covered 90.83 m per minute. We found that TD covered at various SC did not change between the halves during official amputee soccer match. This is in line with the previous study that amputee soccer players covered similar distances in both halves and amputee soccer players do not experience a drop in physical match performance (32). The $speed_{peak}$ attained in the current study during amputee soccer match was 15.77±2.33 km/hr and a dec–

line in $speed_{peak}$ was not statistically evident in the second half. These results are in agreement with a study conducted with amputee soccer players (8).

In soccer, a player's HR during a 90-minute soccer game is rarely below 65% of maximal values and ranges between 80-90% HR_{max}, suggesting that blood flow to the exercising leg muscle is continuously higher than at rest, which means oxygen delivery is high, as well (31, 33). Correspondingly, we found that the average exercise intensity, measured as percentage of individual HR_{max}, during 50-minute amputee soccer match was close to anaerobic threshold and amputee soccer players spent ~15 min at 60-80% HR_{max} and ~31 min at 80-100% HR_{max}. In amputee soccer, the limiting factor of oxidative capacity of contracting muscles is not only dependent on to the unilateral lower limb but also to upper limbs due to usage of bilateral crutch for locomotion. We observed important differences in %HR_{max} between the first and second halves. There was no change time spent at low (0-40%), moderate (40-60%) and high (60-80%) individual HR zones whereas there was a reduction in time spent at 80-100% HR_{max} in the second half. Previous research also reported that time spent at 95% HR_{max} was statistically lower in the second half (1). Our results confirm that exercise intensity in amputee soccer is high and amputee soccer players are under high physiological loads and they play amputee soccer at higher percentages of individual HR_{max}.

Limitation of the present study is that the activity patterns and physiological responses were collected only from five amputee soccer players. It will be relevant in the future studies to include amputee soccer teams from various performance levels in order to capture various results related to activity profiles and physiological responses in amputee soccer matches.

CONCLUSION

This study demonstrated that amputee soccer players spent the first half at higher HR_{max} than in the second half during amputee soccer match. Additionally, time spent at maximal (80-100%) individual HR intensity zone was higher in the first half than in the second half. On the contrary, $speed_{peak}$, TD, percentage of the TD at five SC and time spent at three HR_{max} zones during amputee soccer match were similar in both halves.

Practical applications

Various training strategies can be implemented in amputee soccer to solicit the tactical, physical and technical aspects comparable to match conditions (34). For instance, tactical 5 vs 5 small sided drills of 3 to 5 min can be performed nonstop to develop sport specific endurance (35) and 2 vs 2 small sided drills of 5 to 9 min can be performed nonstop to develop sport specific technical skill as well as agility (36). In soccer, various speed categories were developed to determine the TD (37, 38). From this point of view, new speed categories can be identified in amputee soccer. It is reported that TD at high intensity running and above is crucial in soccer, it determines the game result (39) and soccer players who have high lactate thresholds cover more distances in a game (40). Therefore, small sided games of 8 vs 8, 6 vs 6 and 5 vs 5 can be incorporated to amputee soccer trainings to develop lactate threshold at 85-90% of HR_{max} (41).

Ethics Committee Approval / Etik Komite Onayı

The approval for this study was obtained from Hacettepe University Ethics Committee (Decision no: 2018/106-31 Date: 31.01.2018)

Conflict of Interest / Çıkar Çatışması

The authors declared no conflicts of interest with respect to authorship and/or publication of the article.

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Author Contributions / Yazar Katkıları

Concept FE, TH, AKİ; Design TH, AKİ; Supervision AKİ; Materials FE, TH; Data Collection and/or Processing FE, TH; Analysis and Interpretation FE, TH, AKİ; Literature Review FE; Writing Manuscript FE; Critical Reviews TH, AKİ

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